

Texas Nodal Market Implementation

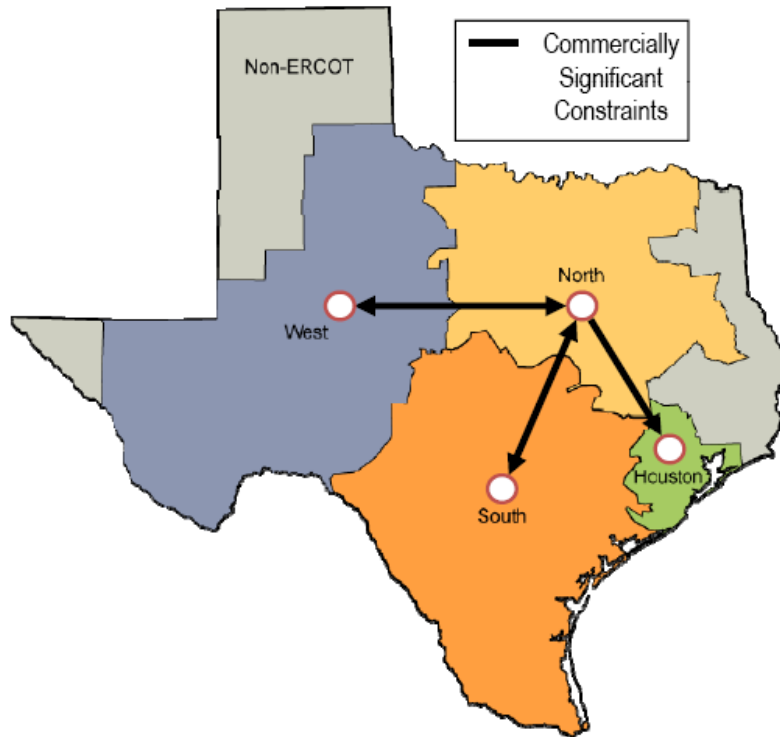
**Electric Utility Commission
May 16, 2011**

**Pat Sweeney
Director, Energy & Market Operations**

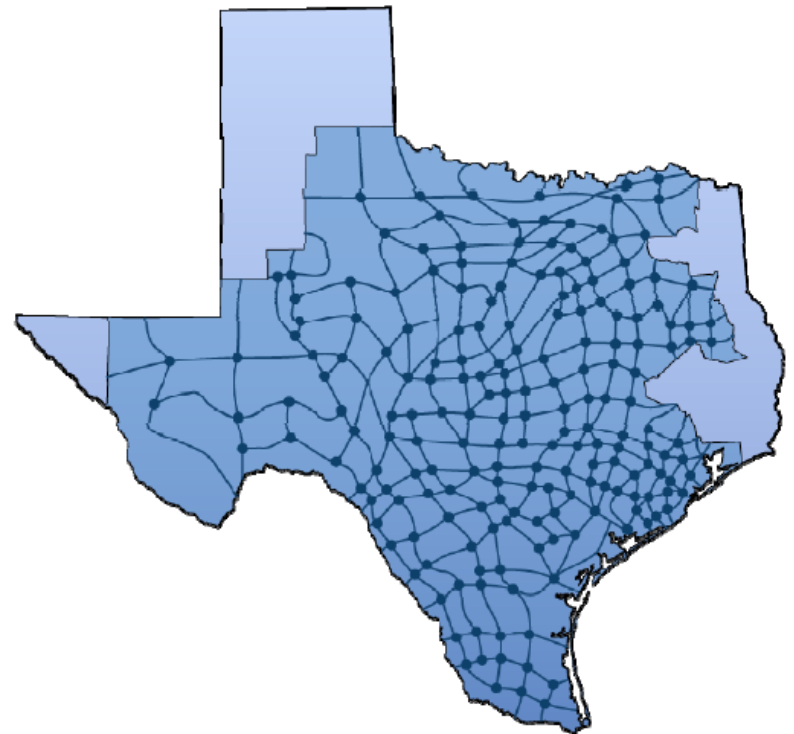


The ERCOT Market Structure Changed significantly in December 2010

Zonal Market



Nodal Market



Nodal History

PUC Subst. R. §25.501 (9/03) required a significant redesign of the ERCOT wholesale market – Originally slated for 2006, then 2008, then 2010

➤ Major features:

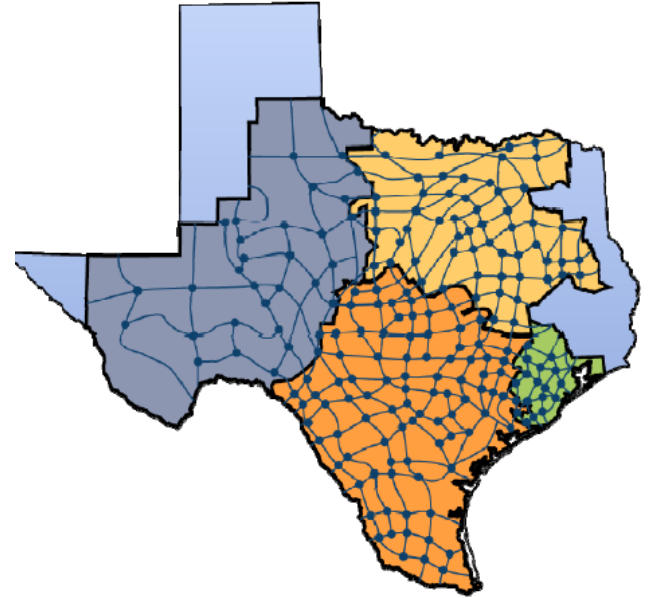
- More efficient dispatch of generation
- Generators provide ERCOT more complete information about plant operations
- Improved ability to anticipate system conditions and minimize transmission congestion
- Direct assignment of transmission congestion costs
- “Day-ahead” energy market
- Help market participants meet load obligation and improve opportunities to “hedge” against real-time balancing energy costs
- Improved market oversight with expanded ERCOT role in market monitoring

➤ Major objectives:

- Allow ERCOT to assign the costs of all congestion
- Encourage efficient location of new transmission and generation facilities
- Add transparency to the market
- Provide more accurate and reasonable energy pricing
- Provide more opportunities for load participation

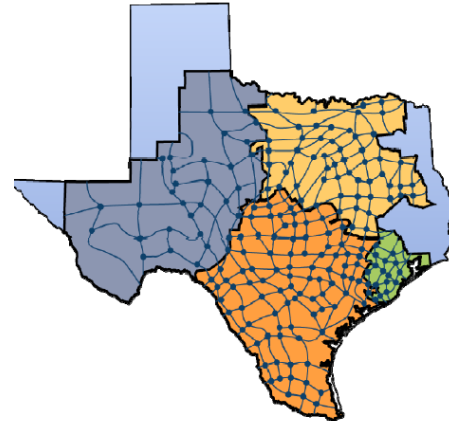
Basic Differences

- System Wide Economic Dispatch
 - by ERCOT rather than by market participants
 - considers transmission constraints
- Resource Specific Offers and Dispatch
- Locational Marginal Prices (LMPs) for ~ 4000 load and resource nodes
 - An LMP represents the value of energy at a location at that time
 - Generators paid the LMP at the resource node
 - Load pays the Load Zone price which is a weighted average of LMPs in the zone
- Transmission Congestion now between a Resource and Load vs. between Zones



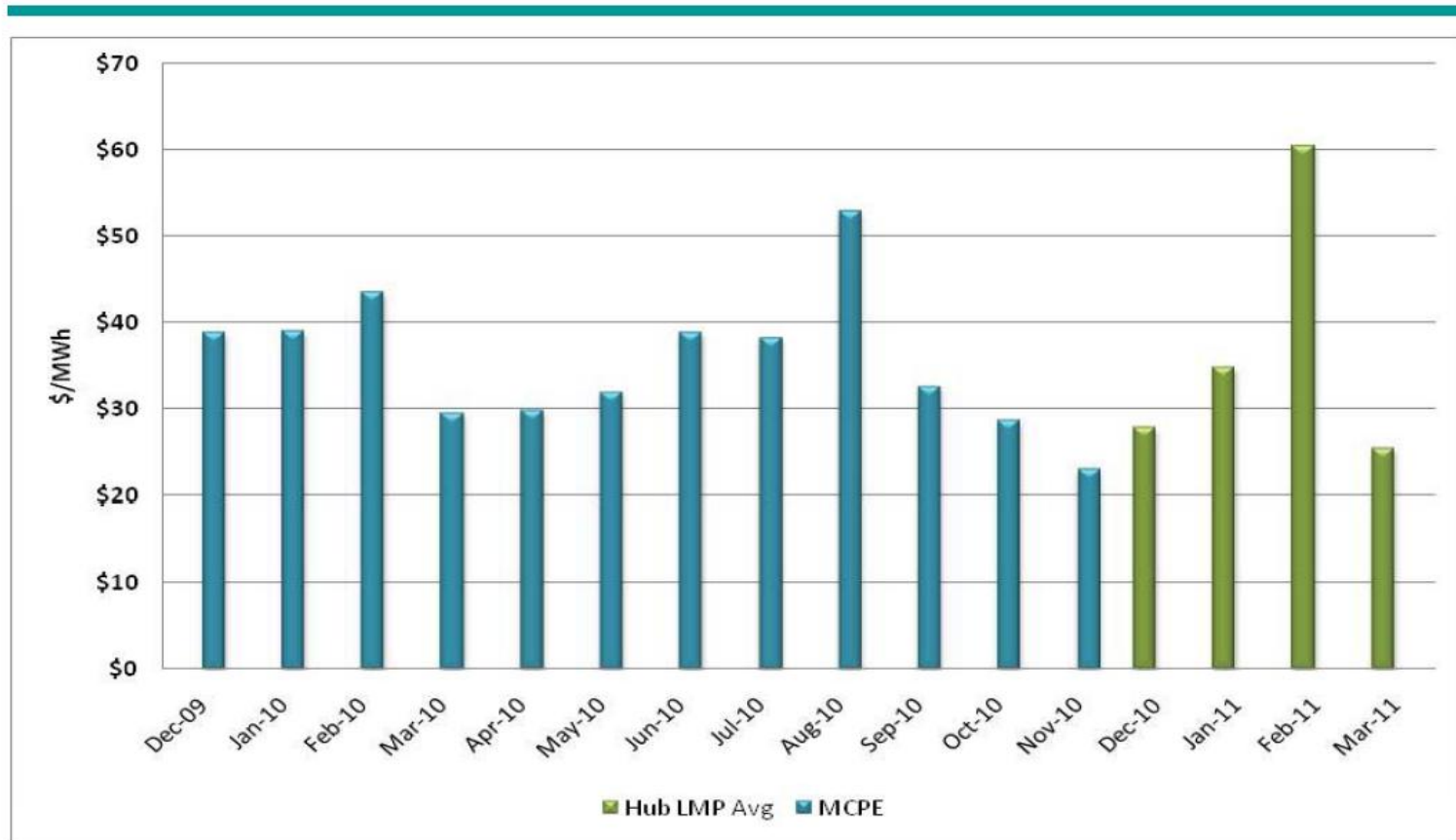
Key Difference

- Under Nodal, Austin Energy Generation and Load are linked financially not by dispatch
- Generator sells to ERCOT or a willing buyer (bilateral)
- Load buys from ERCOT or a willing seller (bilateral)
- Ancillary (Reserve) Services:
 - Offer it to ERCOT and buy from ERCOT
 - ERCOT does the co-optimization between energy & reserve capacity offers
 - No more self provision



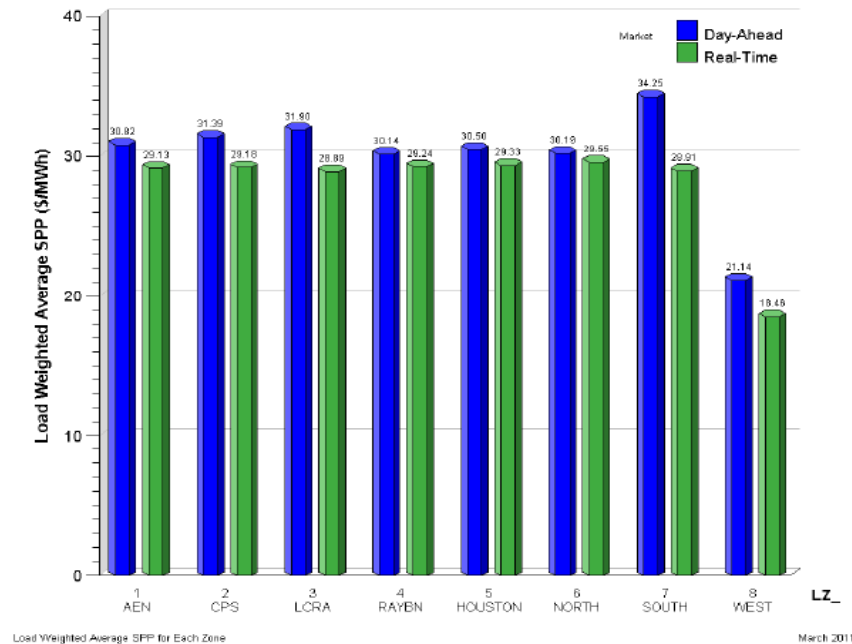
ERCOT Perspective

Average MCPE vs. Average Hub LMP



ERCOT Perspective

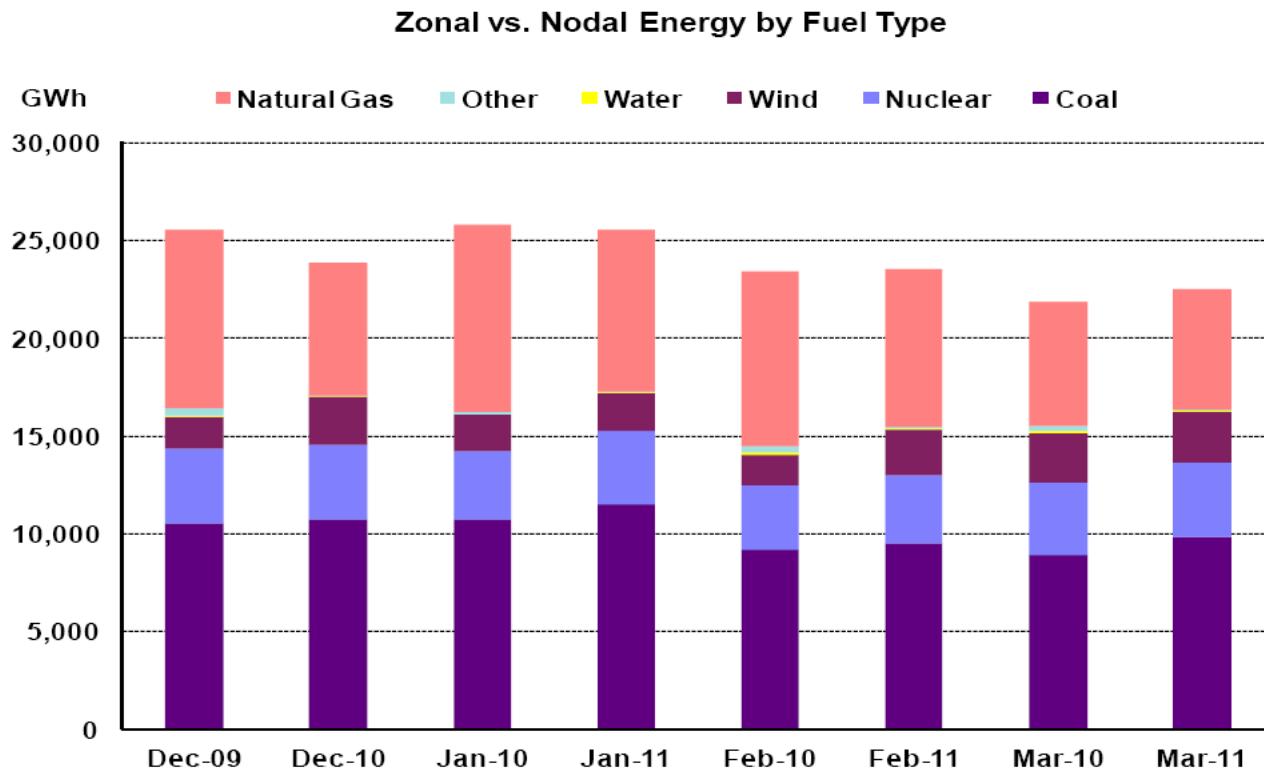
Day ahead market/Real-time price convergence



- The load weighted average RT SPPs were slightly lower than the load weighted average DAM SPPs, which indicates a conservative approach.

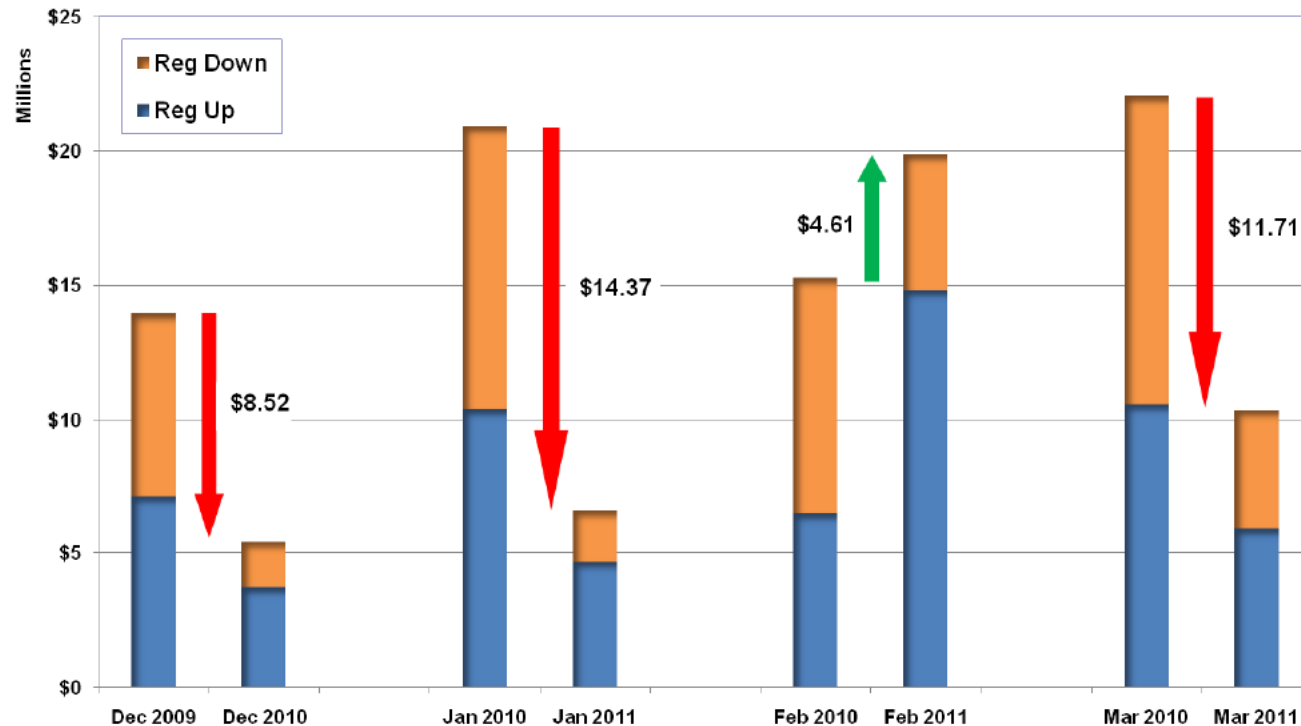
ERCOT Perspective

Zonal vs. Nodal: Energy by Fuel Type



ERCOT Perspective

Regulation Capacity Costs



ERCOT Perspective

Nodal vs. Zonal Summary

- **Telemetry**
 - Point availability improved
- **State Estimator**
 - Improved SE Convergence
 - Improved SE Solution (Lower tolerance)
- **Generation Cost**
 - Reduced cost due to resource specific vs. portfolio dispatch
- **Congestion Management**
 - More precise control
 - More economic dispatch (No out of merit)
- **Reliability Commitments**
 - Lower RUC cost vs. RPRS + OOMC
- **Ancillary Services**
 - Less Regulation required
 - Increased ancillary service location flexibility
- **COPs vs. Resource Plans**
 - Day-ahead Market financial incentives has improved COP accuracy

AE's Perspective

- Market outcomes in line with expectations – underlying drivers such as fuel cost, generation types did not change with Nodal
- ERCOT has acknowledged some issues that could be characterized as fine tuning – as one may expect
 - Inconsistent pricing at some resource nodes (modeling)
 - Wind dispatch oscillations (control algorithms) / performance metrics
 - Some issues such as higher than expected congestion costs in the Rio Grande Valley may be a logical but undesired outcome and result in policy changes – regional price cap
- AE systems, plants and staff have performed well
- Complexity has increased
 - More rules and rule changes
 - Zonal Protocols = 798 pages / Nodal Protocols = 1,124 pages
 - Zonal Changes = 874 over 10 years / Nodal Changes = 375 over 4 years
 - Significant increase in data handling....

Zonal vs Nodal Data Handling

Database comparison	Nodal from December 2010 to April 2011	Zonal from December 2009 to April 2010
Submissions to ERCOT	29,589	13,821
Submission records	11,336,358	3,277,463
Statements	1078	594
Invoices	306	27
Messages from ERCOT	207,827	46,232
Message records	5,965,115	187,835
Market data records	91,534,521	732,592
Gross database size	116.5 GB	.65 GB

In Summary

- Lights still on – reliability maintained
- Too early to draw conclusions:
 - ERCOT and Independent Market Monitor Annual reports covering 2011 not expected until mid-2012
- AE will continue to assess its system and resource needs and adjust its operations based on accumulated experience

Questions?